

Wild Bird Avian Influenza Surveillance in Washington

July 2005 – July 2007

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Introduction

Avian influenza is caused by a virus that naturally occurs in water-associated birds such as ducks, geese, swans, and shorebirds. Avian influenza viruses (AIV) are classified according to two types of proteins present on the surface of the virus, hemagglutinin (H), and neuraminidase (N). There are 16 known hemagglutinin proteins and 9 known neuraminidase proteins, for a total of 144 possible H/N combinations or “subtypes”. Virtually every possible H/N subtype has been found in wild birds, and AIV typically do not cause serious disease in them.

In contrast to wild birds, domestic poultry such as chickens and turkeys can be extremely susceptible to certain strains of AIV. These strains are referred to as “highly pathogenic avian influenza” (HPAI) viruses. The HPAI designation refers only to the severity of disease caused in domestic poultry, and is not related to the potential to cause disease in humans or other species. To date, all known HPAI viruses have been of the H5 or H7 subtypes, although not all H5 and H7 viruses are HPAI viruses. Commercial poultry producers are well aware of the potential threat that wild waterfowl present to domestic poultry, and for decades have taken precautions to prevent contact between domestic and wild birds.

On rare occasions, AIV can mutate or recombine with human influenza viruses and become infectious to humans. Beginning in 2005, an increasing number of human cases of influenza caused by an H5N1 subtype of an AIV were reported in southeast Asia. Prior to that time, infections with this particular virus had primarily been limited to birds. The human cases sparked worldwide concern that this virus could cause another worldwide epidemic (“pandemic”) of influenza in humans, such as those experienced in 1918, 1957, and 1968.

As a result of this concern, several wild bird surveillance programs were initiated in Washington to assess the prevalence of AIV in wild birds, and to provide an “early warning” to poultry producers and public health officials should the H5N1 virus of concern enter the United States via migratory birds.

The purpose of this report is to summarize AIV sampling efforts and test results from wild birds collected in Washington by state and federal agency personnel from July 2005 through July 2007.

Methods

The major program undertaken was a collaboration between the U.S. Fish and Wildlife Service (USFWS), the U.S. Department of Agriculture (USDA), and state wildlife agencies to sample migratory wild birds, which began during the summer of 2006 (referred to hereafter as the “Interagency Plan”). This plan can be found at http://wdfw.wa.gov/wlm/avian_flu/ai_monitoring_plan.pdf.

In addition to samples collected under the Interagency Plan, samples were also collected from birds during routine morbidity and mortality investigations; from birds presented to rehabilitation facilities; and when birds were handled for research purposes.

In a separate effort, over 500 samples were collected from approximately 50 different species of migratory land birds as part of a project based at the University of California, Los Angeles (UCLA). These samples were collected by volunteer bird banders. More information on this program can be found at: http://www.ioe.ucla.edu/CTR/research/AvPath/avian_influenza_main.html. Results from the UCLA project are not available at this time, and this project will not be discussed further in this report.

Cloacal swabs were collected from hunter-harvested birds, live-trapped and released birds, and birds that were examined during routine morbidity and mortality investigations. In addition, fecal samples were collected from the ground in areas where large congregations of waterfowl occurred.

Samples were initially screened for the presence of AIV using a polymerase chain reaction (PCR) assay designed to detect the presence of a matrix protein common to all AIV. Samples that yielded positive matrix results were then screened with a PCR assay designed to detect the presence of H5 or H7 AIV. Samples that yielded positive H5 or H7 results were further characterized, by a variety of means, to determine whether or not they were of the H5N1 subtype, and whether or not they were HPAI viruses.

Results

The majority of samples were collected from July 2006 - July 2007 under the Interagency Plan. Most samples were collected from hunter-harvested waterfowl (n=2,647), and from live-captured and released birds (n = 1,485). The remaining samples were collected from birds during research activities and from routine morbidity and mortality investigations.

A total of 4,395 water-associated birds were tested from July 2005 – July 2007. Five-hundred eighty-nine (13.4%) samples tested positive for the presence of an AIV. Of these, 510 (11.6%) were viruses other than an H5 or H7 subtype, 76 (1.7%) were an H5 virus; and 3 (0.1%) were an H7 virus. All H5 and H7 subtypes were of low pathogenicity to poultry, and no H5N1 subtypes were detected (Table 1).

In general, dabbling ducks had the highest prevalence of AIV infection; with 5/8 species tested yielding an AIV. In descending order, these were: 86/317 (27%) of American widgeon (*Anas americana*), 63/256 (25%) of northern shovelers (*Anas clypeata*), 249/1055 (24%) of mallards (*Anas platyrhynchos*), 79/390 (20%) of American green-winged teal (*Anas crecca*), and 69/474 (15%) of northern pintails (*Anas acuta*) (Table 1).

AIV were detected in 2/7 species of diving ducks tested: 3 / 4 (75%) buffleheads (*Bucephala albeola*) and 5/61 (8%) surf scoters (*Melanitta perspicillata*) (Table 1).

AIV were detected in 4/5 species of geese tested, but at relatively low prevalences. In descending order, these were: 12/190 (6%) black brant (*Branta bernicla*), 10/200 (5%) lesser snow geese (*Chen caerulescens*), 1/60 (2%) Canada geese (*Branta canadensis*), and 5/360 (1%) cackling geese (*Branta hutchinsii*) (Table 1).

Three of 99 (3%) trumpeter swans were infected with an AIV, while none of 4 tundra swans were (Table 1).

AIV were detected in only 2/ 20 species of shorebirds and miscellaneous water-associated birds tested. Three of 323 (0.9%) dunlins (*Calidris alpina*) were infected with an AIV, while only 1/338 (0.3%) western sandpipers (*Calidris mauri*) were (Table 1).

H5 viruses were detected only in dabbling ducks. In descending order of prevalence, these were: mallards, northern pintails, American widgeon, and northern shoveler (Table 1).

H7 viruses were detected in 3 northern shovelers (Table 1).

Two-hundred thirty-five fecal sample pools, representing 1,110 individual samples, were collected from the ground in areas where waterfowl congregate. Nine of the 235 were positive for an avian influenza virus, but not of the H5 or H7 subtypes.

Twenty-one birds examined during morbidity/mortality investigations were tested for the presence of AIV. Two birds were found to be infected with an AIV: a young mallard that died of trauma, and a young Canada goose that died of a parasite infection. Neither of these viruses was an H5 or H7 subtype.

Summary

AIV were detected at rates and from species that were expected, based on numerous surveys done in the United States over the past several decades. Based on samples collected from wild birds in Washington, and previous surveys done elsewhere, it appears that highly pathogenic AIV are rare in wild birds. However, it would be prudent to continue surveillance in wild birds, with particular emphasis on sick and dead birds, to ensure timely detection of highly pathogenic H5N1, or any other highly pathogenic AIV, should they enter the United States.

Table 1. Washington Wild Bird Avian Influenza Test Results, July 2005 – July 2007.

Table 1. Dabbling Duck and Diving Duck Species, July 2000 - July 2001											
			Total # Tested	Total # of AI positives	Proportion of AI positives, all samples	Total # of AI positives (non-H5, non-H7)	Proportion of AI positives (non-H5 or non-H7), all samples	Total # of AI H5 positives (non-H1)	Proportion of AI H5 positives, all samples	Total # of AI H7 positives	Proportion of AI H7 positives, all samples
<u>Dabbling Ducks</u>											
Abbrev	Common Name	Scientific Name									
MALL	mallard	<i>Anas platyrhynchos</i>	1055	249	0.24	190	0.18	59	0.06	0	0
NOPI	northern pintail	<i>Anas acuta</i>	474	69	0.15	59	0.12	10	0.02	0	0
AGWT	American green-winged teal	<i>Anas crecca</i>	390	79	0.20	79	0.20	0	0.00	0	0
AMWI	American wigeon	<i>Anas americana</i>	317	86	0.27	81	0.26	5	0.02	0	0
NSHO	northern shoveler	<i>Anas clypeata</i>	256	63	0.25	58	0.23	2	0.01	3	0.012
BWTE	blue-winged teal	<i>Anas discors</i>	8	0	0	0	0	0	0.00	0	0
WODU	wood duck	<i>Aix sponsa</i>	3	0	0	0	0	0	0.00	0	0
GADW	gadwall	<i>Anas strepera</i>	1	0	0	0	0	0	0.00	0	0
			2504	546	0.22	467	0.19	76	0.03	3	0.001
<u>Diving Ducks</u>											
Abbrev	Common Name	Scientific Name									
USCO	unspecified scoter	<i>Melanitta sp.</i>	113	0	0	0	0	0	0	0	0
SUSC	surf scoter	<i>Melanitta perspicillata</i>	61	5	0.08	5	0.08	0	0	0	0
WWSC	white-winged scoter	<i>Melanitta fusca</i>	13	0	0	0	0	0	0	0	0
BUFF	bufflehead	<i>Bucephala albeola</i>	4	3	0.75	3	0.75	0	0	0	0
RNDU	ring-necked duck	<i>Aythya collaris</i>	3	0	0	0	0	0	0	0	0
CANV	canvasback	<i>Aythya valisineria</i>	1	0	0	0	0	0	0	0	0
COGO	common goldeneye	<i>Bucephala clangula</i>	1	0	0	0	0	0	0	0	0
HARD	harlequin duck	<i>Histrionicus histrionicus</i>	1	0	0	0	0	0	0	0	0
			197	8	0.04	8	0.04	0	0	0	0
<u>Geese</u>											
Abbrev	Common Name	Scientific Name									
CACG	cackling goose	<i>Branta hutchinsii</i>	360	5	0.01	5	0.01	0	0	0	0
LSGO	lesser snow goose	<i>Chen caerulescens</i>	200	10	0.05	10	0.05	0	0	0	0
BLBR	black brant	<i>Branta bernicla</i>	190	12	0.06	12	0.06	0	0	0	0
CAGO	Canada goose	<i>Branta canadensis</i>	60	1	0.02	1	0.02	0	0	0	0
GWFG	greater white-fronted goose	<i>Anser albifrons</i>	1	0	0	0	0	0	0	0	0
			811	28	0.03	28	0.03	0	0	0	0
<u>Swans</u>											
Abbrev	Common Name	Scientific Name									
TRUS	trumpeter swan	<i>Cygnus buccinator</i>	99	3	0.03	3	0.03	0	0	0	0
TUSW	tundra swan	<i>Cygnus columbianus</i>	4	0	0	0	0	0	0	0	0
			103	3	0.03	3	0.03	0	0	0	0

				Proportion of AI							
				Total # of AI positives, all samples	Proportion of AI positives, all samples	Total # of AI positives (non-H5, non-H7)	Proportion of AI positives (non-H5 or non-H7), all samples	Total # of AI H5 positives (non-H1)	Proportion of AI H5 positives, all samples	Total # of AI H7 positives	Proportion of AI H7 positives, all samples
<u>Shorebirds & Misc Water-associated birds</u>											
Abbrev	Common Name	Scientific Name	Total # Tested	# of AI positives	Proportion of AI positives	Total # of AI positives (non-H5, non-H7)	Proportion of AI positives (non-H5 or non-H7), all samples	Total # of AI H5 positives (non-H1)	Proportion of AI H5 positives, all samples	Total # of AI H7 positives	Proportion of AI H7 positives, all samples
WESA	western sandpiper	<i>Calidris mauri</i>	338	1	0.003	1	0.003	0	0	0	0
DUNL	dunlin	<i>Calidris alpina</i>	323	3	0.009	3	0.009	0	0	0	0
LESA	least sandpiper	<i>Calidris minutilla</i>	45	0	0	0	0	0	0	0	0
SBDO	short-billed dowitcher	<i>Limnodromus griseus</i>	25	0	0	0	0	0	0	0	0
SEPL	semipalmated plover	<i>Charadrius semipalmatus</i>	14	0	0	0	0	0	0	0	0
SAND	sanderling	<i>Calidris alba</i>	12	0	0	0	0	0	0	0	0
REPH	red-necked phalarope	<i>Phalaropus lobatus</i>	4	0	0	0	0	0	0	0	0
DCCO	double-crested cormorant	<i>Phalacrocorax auritus</i>	3	0	0	0	0	0	0	0	0
UNGU	unidentified gull	<i>Larus sp.</i>	3	0	0	0	0	0	0	0	0
REKN	red knot	<i>Calidris canutus</i>	2	0	0	0	0	0	0	0	0
FTSP	fork-tailed storm petrel	<i>Oceanodroma furcata</i>	2	0	0	0	0	0	0	0	0
RUTU	ruddy turnstone	<i>Arenaria interpres</i>	1	0	0	0	0	0	0	0	0
COMU	common murre	<i>Uria aalge</i>	1	0	0	0	0	0	0	0	0
GWGU	glaucous-winged gull	<i>Larus glaucescens</i>	1	0	0	0	0	0	0	0	0
RHAU	rhinoceros auklet	<i>Fratercula corniculata</i>	1	0	0	0	0	0	0	0	0
BRAC	Brandt's cormorant	<i>Phalacrocorax penicillatus</i>	1	0	0	0	0	0	0	0	0
MAMU	marbled murrelet	<i>Brachyramphus marmoratus</i>	1	0	0	0	0	0	0	0	0
ANMU	ancient murrelet	<i>Synthliboramphus antiquus</i>	1	0	0	0	0	0	0	0	0
PECO	pelagic cormorant	<i>Phalacrocorax pelagicus</i>	1	0	0	0	0	0	0	0	0
WEGR	western grebe	<i>Aechmophorus occidentalis</i>	1	0	0	0	0	0	0	0	0
			780	4	0.005	4	0.005	0	0	0	0
Totals			4395	589	0.134	510	0.116	76	0.017	3	0.001